Name: Key Period: _____ Date: _____

Moles and Stoichiometry Practice Test

1. Given: 8 moles of Zinc
   Convert to: atoms

   4.82×10^{24} atoms Zn

2. Given: 5.8×10^{24} atoms of Uranium
   Convert to: moles

   9.63 mol U

3. Given: 293.47 grams of Nickel
   Convert to: moles

   5 mol Ni

4. Given: 7 moles of Cobalt
   Convert to: grams

   412.51g Co

5. Given: 4 moles of CO_2
   Convert to: grams

   Molar mass of CO_2 = 44.01 g

   176.04 g CO_2

6. Given: 25 grams of NH_3
Convert to: moles

Molar mass of NH_3 = 17.04g

1.47 mol NH_3

7. Given: 7 moles of N_2F_3
Convert to: grams

Molar mass of N_2F_3= 85.02g

595.14g N_2F_3

8. Aspartame is an artificial sweetener that is 160 times sweeter than regular sugar. It is marketed as NutraSweet, and it's the sweetener in Diet Coke. The chemical formula for aspartame is $C_{14}H_{18}N_2O_5$.

a) Calculate the molar mass of aspartame.

294.34g

b) Calculate the mass in grams of 1.56 moles of aspartame.

459.17 g

c) A 12-ounce can of Diet Coke contains 0.200 grams of aspartame. How many moles is this?

6.8×10^{-4} mol

1. What is the percent composition of copper in $CuBr_2$?

222.8

28.28% Cu

2. What is the percent composition of oxygen in NaOH?

40.01

40% O

3. What is the percent composition of S in N_2S_2?

92.16

69.6% S

4. Calculate the empirical formula of a compound made up of 76.84% carbon, 12.92% hydrogen, and 10.24% oxygen.

Element 1: C Element 2: H Element 3: O

1. Convert from PERCENT to MASS	76.84g C	12.92g H	10.24g O
2. Convert from MASS to MOLES	6.4	12.79	.64
3. Divide both numbers by the smallest number of moles	10	20	1
5. Write the empirical formula	$C_{10}H_{20}O$		

5. A compound is found to contain 57.14% carbon, 6.16% hydrogen, 9.52% nitrogen, and 27.18% oxygen. What is its empirical formula?

1. Convert from PERCENT to MASS	57.14g C	6.16g H	9.52g N	27.18g O
2. Convert from MASS to MOLES	4.76	6.1	.68	1.7
3. Divide both numbers by the smallest number of moles	7	9	1	2.5
4. Multiply to get whole numbers	14	18	2	5
5. Write the empirical formula	$C_{14}H_{18}N_2O_5$			

6. What is the molecular formula of a compound with an empirical formula of Cr_2O_3 and a formula mass of 608.0 g/mol?

$$\frac{608}{152} = 4 \rightarrow Cr_8O_{12}$$

7. What is the molecular formula of a compound with an empirical formula of C_5H_7N and a formula mass of 162.1 g/mol?

$$\frac{162.1}{81.13} = 2 \rightarrow C_{10}H_{14}N_2$$

Stoichiometry

Use the following equation for problems 1-3:

$$CH_4 + 2\ O_2 \rightarrow CO_2 + 2\ H_2O$$

1. Given: 19 moles O_2 Convert to: moles H_2O

$$\frac{19\ mol\ O_2}{} \left| \frac{2\ mol\ H_2O}{2\ mol\ O_2} \right. = 19\ mol\ H_2O$$

2. Given: 75 moles CH_4 Convert to: moles O_2

$$\frac{75\ mol\ CH_4}{} \left| \frac{2\ mol\ O_2}{1\ mol\ CH_4} \right. = 150\ mol\ O_2$$

3. Given: 0.25 moles CH_4 Convert to: moles CO_2

$$\frac{.25\ mol\ CH_4}{} \left| \frac{1\ mol\ CO_2}{1\ mol\ CH_4} \right. = .25\ mol\ CO_2$$

Use the following equation for problems 4-6:

$$2\ Fe_2O_3 + 3\ C \rightarrow 4\ Fe + 3\ CO_2$$

4. Given: 5 grams Fe_2O_3 Convert to: grams Fe

$$\frac{5g\ Fe_2O_3}{} \left| \frac{1\ mol\ Fe_2O_3}{159.7g\ Fe_2O_3} \right| \frac{4\ mol\ Fe}{2\ mol\ Fe_2O_3} \left| \frac{55.85g\ Fe}{1\ mol\ Fe} \right. = 3.5g\ Fe$$

5. Given: 100 grams C Convert to: grams CO_2

$$\frac{100g\ C}{} \left| \frac{1\ mol\ C}{12.01g\ C} \right| \frac{3\ mol\ CO_2}{3\ mol\ C} \left| \frac{44.01g\ CO_2}{1\ mol\ CO_2} \right. = 366.44g\ CO_2$$

6. Given: 500 grams Fe_2O_3 Convert to: grams C

$$500g\ Fe_2O_3 \left| \frac{1mol\ Fe_2O_3}{159.7g\ Fe_2O_3} \right| \frac{3mol\ C}{2mol\ Fe_2O_3} \left| \frac{12.01g\ C}{1mol\ C} \right| = 56.4g\ C$$

Theoretetical and Percent Yield

Use the following equation for problems 7-10: $3\ PbO + 2\ NH_3 \rightarrow 3\ Pb + N_2 + 3\ H_2O$

7. What is the theoretical yield in MOLES of N_2 if you begin with 10 moles of NH_3?

$$10mol\ NH_3 \left| \frac{1mol\ N_2}{2mol\ NH_3} \right| = 5mol\ N_2$$

8. You did the reaction from #7 in class and produced 4.5 moles of N_2. What was your percent yield?

$$\frac{4.5}{5} \times 100 = 90\%\ yield$$

9. What is the theoretical yield in GRAMS of H_2O if you begin with 100 grams of PbO?

$$100g\ PbO \left| \frac{1mol\ PbO}{223.2g\ PbO} \right| \frac{3mol\ H_2O}{3mol\ PbO} \left| \frac{18.02g\ H_2O}{1mol\ H_2O} \right| = 8.07g\ H_2O$$

10. You did the reaction from #9 in class and produced 5 grams of H_2O. What was your percent yield?

$$\frac{5}{8.07} \times 100 = 61.93\%\ yield$$

Extra Practice

Multiple Choice

Choose the best answer and write its letter on the line.

1. In a chemical reaction, the mass of the products
   a. is less than the mass of the reactants.
   b. is greater than the mass of the reactants.
   c. is equal to the mass of the reactants.

2. How many molecules of NO_2 are produced when 2.0×10^{20} molecules of N_2O_4 are decomposed according to the following equation? $N_2O_4 \rightarrow 2\ NO_2$
   a. 4
   b. 1.0×10^{20}
   c. 2.0×10^{20}
   d. 4.0×10^{20}

   SKIP

3. A reaction that has been calculated to produce 60.0 g of $CuCl_2$ actually produces 50.0 g of $CuCl_2$. What is the percent yield?
   a. 0.833%
   b. 96.1%
   c. 83.3%
   d. 120%

4. In any chemical reaction, the quantities that are conserved are
   a. the number of moles and the volumes.
   b. the number of molecules and the volumes.
   c. mass and number of atoms.
   d. mass and moles.

Questions 11-12 refer to the following equation:

$3\ Cu + 8\ HNO_3 \rightarrow 3\ Cu(NO_3)_2 + 2\ NO + 4\ H_2O$

5. Calculate the number of moles of water produced when 3.3 mol of $Cu(NO_3)_2$ are formed in the reaction.
   a. 4.4 mol
   b. 6.6 mol
   c. 4.9 mol
   d. 8.8 mol

6. How many grams of Cu would be needed to react with 2.0 mol HNO_3?
   a. 95.3 g
   b. 63.5 g
   c. 47.6 g
   d. 1.50 g